

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE		PAGE OF PAGES 1 2	
2. AMENDMENT/MODIFICATION NO. 0005		3. EFFECTIVE DATE 08-Apr-2003		4. REQUISITION/PURCHASE REQ. NO. W68MD9-2338-3082		5. PROJECT NO.(If applicable)	
6. ISSUED BY USA ENGINEER DISTRICT, SEATTLE ATTN: CENWS-CT P.O. BOX 3755 SEATTLE WA 98124-3755		CODE DACW67		7. ADMINISTERED BY (If other than item 6) See Item 6		CODE	
8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)				X		9A. AMENDMENT OF SOLICITATION NO. DACW67-03-R-0003	
				X		9B. DATED (SEE ITEM 11) 06-Dec-2002	
						10A. MOD. OF CONTRACT/ORDER NO.	
						10B. DATED (SEE ITEM 13)	
CODE		FACILITY CODE					
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS							
<input checked="" type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer <input type="checkbox"/> is extended, <input checked="" type="checkbox"/> is not extended. Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.							
12. ACCOUNTING AND APPROPRIATION DATA (If required)							
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.							
A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.							
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).							
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:							
D. OTHER (Specify type of modification and authority)							
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input type="checkbox"/> is required to sign this document and return _____ copies to the issuing office.							
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) DACW67-03-R-0003 AMENDMENT 0005 Pacific Sound Resources Superfund Site Dredging, Marine Sediment Unit Seattle, King County, Washington							
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.							
15A. NAME AND TITLE OF SIGNER (Type or print)				16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)			
				TEL: _____ EMAIL: _____			
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)		15C. DATE SIGNED		16B. UNITED STATES OF AMERICA BY _____ (Signature of Contracting Officer)		16C. DATE SIGNED 08-Apr-2003	

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

Amendment 0005 is issued to provide the following:

1. Revision to Section 02483 SEDIMENT CAP, Table 02483-1 Beach Sand Gradation.
2. Proposal Due Date and time remain unchanged. 10 April 2003, 2:00 PM local time.
3. NOTICE TO OFFERORS: Offerors must acknowledge receipt of this amendment by number and date on offer or by telegram. Please mark on outside of the envelope in which the offer is enclosed to show amendment received.

Encl:

Section 02483 (revised)

(End of Summary of Changes)

SECTION 02483

SEDIMENT CAP

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

The Work includes furnishing all labor, materials, tools and equipment necessary for placement of capping materials within the Marine Sediment Unit (MSU) for remediation of Pacific Sound Resources (PSR) Superfund Site (Site) sediments. For engineering purposes the MSU cap area is subdivided into "remediation areas" (RAs) according to specific site conditions and operational considerations that require different cap designs, cap materials specifications, or construction methods. The Work includes capping of the following RAs: RA1, RA2a, RA2b, RA3, and RA4. Capping of RA1 is included in the Base Contract; capping of RA2a, RA2b, RA3, and RA4 may be awarded as options by the Contracting Officer (CO). The capping boundaries are shown on the Drawings. Based on the defined boundaries, the plan view cap area for these RAs totals approximately 36.4 acres.

The Contractor shall select materials that are approved by the CO as suitable capping materials, and transport them to the Site. The Contractor shall use only approved borrow materials (see Section 01450 CHEMICAL DATA QUALITY CONTROL for chemical requirements). The Contractor shall place the cap as described in this section and as shown on the Drawings.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. The most recent version of the reference applies.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 422	(1963; R 1998) Particle-Size Analysis of Soils
ASTM D 2488	(2000) Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)

ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA SW-846	(Rev O; updates I, II, IIA, IIB, III, and IIIA) Test Methods for Evaluating Solid Waste (Vol IA, IB, IC, and II)
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WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (WSDOT)

WSDOT	(2000) Standard Specifications for Road, Bridge and Municipal Construction
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PUGET SOUND ESTUARY PROGRAM (PSEP)

PSEP (1997) Recommended Guidelines for Sampling Marine Sediment, Water Column, and Tissue in Puget Sound. In "Puget Sound Protocols and Guidelines"

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES.

SD-01 Data

Contractor's Capping Plan; GA

The Contractor shall submit a capping plan as part of the Site Work Plan in accordance with Section 01400 REMEDIAL ACTION MANAGEMENT PLAN that includes the means of transporting and stockpiling materials, proposed capping methods, sequences of work and coordination with the dredging and nearshore work, means of measuring progress, means of cap verification and navigation positioning. The Contractor's capping plan shall define specific methods for verification of the cap layers in RA1, including the verification methods specified in this section and additional methods that may be proposed by the Contractor. Such additional methods may include additional segmentation of RA1, plotting of mechanical bucket positioning data, frequent leadline surveys, underwater video documentation, or other methods. The Contractor shall coordinate with Section 02325 DREDGING for related elements.

SD-09 Reports

Pre-Construction Testing Report; GA.

The Contractor shall submit a Pre-Construction Testing Report no later than 45 calendar days after the CO approves such testing, and 10 calendar days prior to the start of construction, that summarizes the test procedures and results for the borrow source pre-construction analyses. Results shall include, but not be limited to, sieve analysis and physical and chemical test reports for borrow source characterization.

SD-13 Certificates

Procurement of Borrow Materials; GA.

Laboratory test result showing that the borrow material is uncontaminated. Provide certificates indicating that the commercial borrow source operation complies with applicable Federal, State, and local regulations.

Testing; GA.

Qualifications and validation of the commercial testing laboratory or Contractor's testing facilities. Refer to Section 01451 CONTRACTOR QUALITY CONTROL for requirements.

1.4 CONSTRUCTION FACILITIES

Temporary navigation aids and lights for Contractor's marine equipment shall be in accordance with Section 01500 TEMPORARY CONSTRUCTION FACILITIES.

1.5 ARTIFICIAL OBSTRUCTIONS

The Government has no knowledge of existing wrecks, wreckage, or other material of such size or character as to require special or additional equipment except as shown on Drawings. However, the Contractor may encounter debris or other obstructions such as riprap slope facing, stone chunks, pieces of broken cable, and old timber logs and piling during the capping that are not shown on the Drawings.

1.5.1 RA1 Obstructions

1.5.1.1 Piling, Viewing Pier, and Eastern Pier

The majority of the existing piling in RA1 will be removed by others prior to capping as shown on the Drawings. The viewing pier (a pile-supported structure) and a small pier on the eastern edge of the project limits will remain in RA1, and capping beneath these piers shall be conducted by the Contractor where shown on the Drawings. Cap material shall be cast under the viewing pier using conveyors, mechanical equipment, or hydraulic washing, or mechanically graded into place at higher beach elevations or other methods approved by the CO.

1.5.1.2 Crowley Marine Services Pier

The area under the Crowley Marine Services pier has little available clearance in which to accommodate a cap. The Contractor shall place a thin layer (6 inches) of gravel mix capping material under this pier.

1.5.1.3 Former Longfellow Creek Overflow Outfall

An engineered extension of this pipe is required to accommodate the cap in this area in accordance with Section 02630 STORM DRAINAGE. The cap will also require scour protection at the outfall, consisting of a riprap apron, in accordance with paragraph 2.1.7 Riprap.

1.5.1.4 Unidentified East Outfall

This outfall is a dilapidated 12-inch steel pipe at approximately +8 feet mean lower low water (MLLW), on the eastern portion of the shoreline near the elevated bench. No flow has been observed from this pipe. The pipe shall be grouted with concrete in accordance with Section 02630 STORM DRAINAGE, and the cap in this area shall be placed over the pipe as shown on the Drawings.

1.5.2 RA3 Obstructions

The dolphins in RA3 are pile-supported structures. Cap material shall be cast under the dolphins. Several overhead steel cables are strung between the dolphins and the Crowley Marine Services pier. Coordination with Crowley Marine Services will be required to temporarily remove the cables.

PART 2 PRODUCTS

2.1 MATERIAL SOURCES

Material sources shall be selected well in advance of the time when the material will be required. Suitable representative samples and test reports shall be submitted to and approved by the CO prior to delivery of materials to the Site. The Contractor shall ensure that there is an availability of an adequate and acceptable materials source, based on quantity, quality, and gradation to complete the Work. All borrow sources and imported materials used by the Contractor shall meet the specifications listed below.

2.1.1 Beach Sand

The Contractor shall select materials that meet the quality requirements listed below from an existing commercial source or sources. Material shall be “clean sand” with no man-made or environmental contaminants. Black sand or other dark sand will not be accepted. Beach sand shall consist of non-fractured, river-washed, naturally occurring, round to oblong material meeting the gradation requirements of Table 02483-1.

**Table 02483-1
BEACH SAND GRADATION**

Particle Size (US Sieve Size)	Percent Passing
No. 4	100
No. 8	85 to 100
No. 16	65 to 85
No. 30	40 to 75
No. 40	35 to 65
No. 200	<u>0 to 10</u> to 20

2.1.2 Sand Cap Mix

The Contractor shall select materials, which meet the quality requirements listed below from an existing commercial source or sources. Material shall be “clean sand” primarily subangular, with no man-made or environmental contaminants. Gradations for the sand cap mix capping material are shown in Table 02483-2. The sand cap mix shall have a minimum total organic carbon (TOC) content of 0.5 percent by weight. Sand cap mix shall contain no floatable material.

**Table 02483-2
SAND CAP MIX GRADATION**

Particle Size (US Sieve Size)	Percent Passing
3/8-inch	100
1/4-inch	90 to 100
No. 8	40 to 100
No. 50	2 to 60
No. 200	0 to 10

2.1.3 Coarse Sand Mix

The Contractor shall select materials, which meet the quality requirements listed below from an existing commercial source or sources. Material shall be “clean sand” with no man-made or environmental contaminants. Coarse sand mix shall conform to the gradation requirements shown in Table 02483-3.

**Table 02483-3
COARSE SAND MIX GRADATION**

Particle Size (US Sieve Size)	Percent Passing
1/2-inch	100
3/8-inch	80 to 100
No. 4	30 to 50
No. 8	2 to 10
No. 200	0 to 5

2.1.4 Gravel Mix

The Contractor shall select materials from an existing commercial source or sources. Gravel mix shall be well-graded, sandy gravel, primarily angular or subangular as defined by ASTM D 2488, with no man-made or environmental contaminants. Gravel mix shall conform to the gradation requirements shown in Table 02483-4.

**Table 02483-4
GRAVEL MIX GRADATION**

Particle Size (US sieve size)	Percent Passing
2 1/2-inch	100
2-inch	65 to 100
1-inch	50 to 85
1/4-inch	30 to 50
No. 40	0 to 16
No. 200	0 to 9

2.1.5 Filter Material No. 1

The Contractor shall select materials from an existing commercial source or sources. Filter material No. 1 shall be clean, free-draining sandy gravel and cobbles, primarily angular or subangular as defined by ASTM D 2488, with no man-made or environmental contaminants. Filter material No. 1 shall conform to the gradation requirements shown in Table 02483-5.

**Table 02483-5
FILTER MATERIAL NO. 1 GRADATION**

Particle Size (US sieve size)	Percent Passing
8-inch	100
3-inch	30 to 75
2-inch	20 to 60
3/4-inch	15 to 40
No. 40	0 to 5
No. 200	0 to 5

2.1.6 Filter Material No. 2

The Contractor shall select materials from an existing commercial source or sources. Filter material No. 2 shall be clean, free-draining sand and gravel, primarily angular or subangular as defined by ASTM D 2488, with no environmental contaminants. Filter material No. 2 shall conform to the gradation requirements shown in Table 02483-6. Filter material No. 2 shall have a minimum TOC content of 0.5 percent by weight. Filter material No. 2 shall contain no floatable material.

**Table 02483-6
FILTER MATERIAL NO. 2 GRADATION**

Particle Size (US sieve size)	Percent Passing
2 1/2-inch	100
2-inch	65 to 100
1-inch	50 to 85
1/4-inch	30 to 50
No. 40	0 to 16
No. 200	0 to 9

2.1.7 Riprap

Riprap shall consist of broken stone that is hard, sound, dense, and durable from an approved source. Riprap shall be free from seams, cracks, and other defects tending to destroy its resistance to weather and seawater. Dry unit weight shall not be less than 160 pounds per solid cubic foot. Rock for riprap shall be angular; each piece shall have its greatest dimension not greater than three times its least dimension. Riprap shall conform to the gradation requirements shown in Table 02483-7.

**Table 02483-7
RIPRAP GRADATION**

Weight of Individual Pieces (pounds)	Percent Passing by Weight (percent of pieces lighter than the stated weight)
50	10 to 20
300	10 to 50
1000	100

2.1.8 Habitat Mix

The Contractor shall select materials from an existing commercial source or sources. Habitat mix shall consist of clean, naturally occurring rounded or sub-angular river sandy gravel, primarily (greater than 80 percent) igneous or metamorphic rock. Individual stones shall be generally free of seams, cracks, and other defects tending to destroy its resistance to weathering. Bulk material shall be free of soil, clay balls, debris, wood, organic matter, and other extraneous material. Habitat mix shall meet the gradation requirements of Table 02483-8.

**Table 02483-8
HABITAT MIX GRADATION**

Particle Size (US sieve size)	Percent Passing
2-inch	100
1 1/2-inch	80 to 95
3/4-inch	50 to 80
No. 4	30 to 50
No. 200	0 to 8

2.2 GRADATION TESTS

Prior to starting placement of materials and using samples selected by the CO, the Contractor shall conduct as directed at least one, but not more than two gradation tests (ASTM D 422) from each material type and borrow source, except for riprap. A USACE-certified laboratory using standard sieve sizes shall conduct tests. Minimum test sample size shall be 200

pounds. All costs of such tests shall be borne by the Contractor and shall be incidental to placing materials. Results of such tests shall be submitted for approval in the Pre-Construction Testing Report prior to placement of material.

2.3 ACCEPTANCE CRITERIA FOR CAP MATERIALS

Materials shall be inspected at the Site prior to placement. The Contractor shall be responsible for maintaining gradations as specified. Materials which do not meet gradation or quality as herein before specified will be rejected and no payment will be made regardless of any general or provisional acceptance of materials from a stockpile or pit source. In addition to tests required in paragraph 2.2 GRADATION TESTS, one gradation test shall be conducted for each 10,000 tons of each gradation of material delivered to the Site for placement. Minimum test sample size shall be 200 pounds. Additional tests shall be conducted if furnished materials do not meet gradation requirements. Results of tests shall be furnished to the CO within 24 hours following selection of sample. All costs of such tests shall be borne by the Contractor and shall be incidental to placing materials.

For the sediment cap, the acceptance standard for the cap material is as follows:

- a. Borrow material shall not be obtained from an industrial Site, nor suspected to have been modified by the addition of man-produced chemicals.
- b. Borrow material shall meet the requirements shown in Tables 02483-1 through 02483-8.
- c. Borrow material (with the exception of riprap, gravel mix, and filter material No.1) shall have chemical concentrations at or below criteria in Table 01450-2 in Section 01450 CHEMICAL DATA QUALITY CONTROL.
- d. All borrow material (with the exception of riprap, gravel mix, and filter material No.1), shall be sampled and analyzed for semi-volatile organics (SW-846 Method 8270), inorganics (SW-846 Method 6000/7000), polychlorinated biphenyls (PCBs) (SW-846 Method 8082), pesticides (SW-846 Method 8081) and TOC (SW-846 Method 9060).
- e. Borrow material shall meet the TOC requirements where specified for the material type.
- f. The required frequency of analyses for chemical concentrations and TOC content of the borrow materials are as follows:
 - i. Two separate samples and chemical analyses of each material shall be initially required.
 - ii. Additionally, two separate samples and chemical analyses of each material shall be required at the beginning of the second and third construction season (if a third season is needed).

- iii. Two additional samples and analyses shall be required if a material is obtained from a different supplier than the originally tested material.
- iv. Riprap, gravel mix, and filter material No.1 do not require chemical testing.

For riprap, the CO will designate a qualified geotechnical engineer to visually inspect the riprap at the quarry source. The geotechnical engineer will inspect the riprap for size distribution, hardness, durability, angularity, shape, porosity, and presence of deleterious material. Approval of the riprap by the CO's designee is required prior to its delivery to the Site.

PART 3 EXECUTION

3.1 BARGE REQUIREMENTS

Barges employed for hauling clean imported materials may be either bottom-dump or flat type. Bottom-dump barges shall be tightly sealed to prevent leakage of materials. The Contractor's Environmental Protection Plan (submitted with the RAMP, in accordance with Section 01400 REMEDIAL ACTION MANAGEMENT PLAN and Section 01355 ENVIRONMENTAL PROTECTION) shall address how leaks will be prevented, contained, and cleaned up should they occur.

Navigation aids and lights for all marine equipment shall be in accordance with Section 01500 TEMPORARY CONSTRUCTION FACILITIES. The Contractor shall manage vessels and avoid interference with navigation in accordance with Section 02325 DREDGING, and in accordance with the vessel management plan described in Section 01400 REMEDIAL ACTION MANAGEMENT PLAN.

Positioning Control shall be in accordance with the applicable requirements of Section 01720 SURVEYING.

3.2 PLACEMENT OF MATERIAL

Borrow material shall be transported and placed from barges in the cap areas as shown on the Drawings. Payment will not be made for any material that is deposited elsewhere than in the designated RAs, unless otherwise directed by the CO. Floatable material shall not be placed in open-water areas. Prior to capping, the Contractor shall provide advance notice to the U.S. Coast Guard (USCG) – Notice to Mariners, and coordinate with the CO regarding other site users (e.g., Crowley Marine Services and tribal fisheries departments).

Placement of capping materials shall be accomplished such that material deposits form a uniform layer of the required thickness over the designated area, and water quality compliance criteria are not exceeded. Placement method(s) shall be used that minimizes any resuspension of bottom sediments to prevent contamination of the capping materials. All caps will be constructed with multiple lifts of material, as described herein. Placement methods shall be modified if the resulting cap lift thickness exceeds the maximum lift

thickness shown on Table 02483-9. With the exception of the initial gravel mix lifts in RA1, placement of cap material shall be accomplished such that intermingling of existing contaminated sediments with cap material is minimized.

The allowable lift thicknesses, placement rates, and consolidation periods, and cap thickness requirements are summarized in Tables 02483-9 and 02483-10, respectively. At the direction of the CO, the Contractor shall modify the placement methods if the monitoring results are not acceptable (e.g., if cores show non-uniform placement or excessive mixing of cap material with underlying sediments). To verify compliance with the requirements of Table 02483-10, the Contractor shall submit the following information with each Daily Quality Control Report, in accordance with Section 01451:

- a. Drawing showing area in which cap material was placed
- b. Calculated area (acres) in which cap material was placed, to the nearest 0.1 acre
- c. Type of material placed
- d. Lift number
- e. Quantity of material placed (tons)
- f. For riprap placed in keys or toe berm, the quantity of material placed per linear foot.

3.2.1 RA1 Material Placement

Placement shall be accomplished mechanically placing borrow material in the RA1 cap area from a barge. Other method(s) of placement proposed by the Contractor shall be approved in advance by the CO. Cap material shall be placed in lifts with thicknesses not to exceed those shown in Table 02483-9. Material shall be graded to the dimensions shown on the Drawings. Earth moving equipment may be used for final cap grading in RA1 but shall not operate below water. Equipment such as conveyors may be used to place materials under the piers.

3.2.1.1 Slope Capping in RA1

The intent of the slope cap is to provide a compact blanket of riprap over designated slope areas. The slopes shall be capped as follows:

- a. Before placing slope protection materials, the slopes shall be dressed to the lines and grades shown on the Drawings. All slope protection materials shall be placed starting at the base of the slope and working upwards.
- b. Riprap Key (where shown on the Drawings): At the base of slopes to be capped, a riprap key shall be excavated during dredging, to the dimensions indicated on the Drawings. When construction of the slope cap begins, the excavated key will be filled with riprap to provide a firm base for supporting the overlying slope cap. Placing of riprap by any method likely to cause segregation will not be permitted.

- c. Where toe berms are called out on the Drawings, the entire thickness of the toe berm shall be placed prior to working upward. Placing of riprap by any method likely to cause segregation will not be permitted.
- d. Filter Material Layer: A layer of filter material shall be placed on the prepared slopes to the full thickness and limits specified on the Drawings using methods that will not cause segregation of particle sizes within the bedding. Materials shall be uniformly deposited over the slopes such that the surface of the layer is even and free from mounds or windrows. Dumping above the waterline for underwater placement shall be prohibited.
- e. Riprap Armoring Layer: Riprap shall be placed over the filter material layer in a manner that will produce a close-fitting and well-keyed mass of rock and so as to minimize the percentage of voids. The riprap layer shall be constructed to the lines, grades, and thickness shown on the Drawings.

Riprap shall be placed in sections perpendicular to the slope axis, immediately after the slope has been dressed with the filter material, to prevent damage of filter materials due to waves or tidal fluctuations. The riprap shall be placed over the filter material layer to its full course thickness in one operation and in such a manner as to avoid displacing the underlying material. Riprap shall be placed starting at the base of the slope and working upwards. Any damage to the filter material layer shall be repaired prior to placing the riprap. Placing of riprap by any method likely to cause segregation will not be permitted. The larger rock shall be well distributed and all rock shall be so placed and distributed such that there will be no large accumulation or areas composed largely of either the larger or smaller sizes of rock.

Hand placing or rearranging of individual rock by mechanical equipment may be required to secure results specified above. There shall be no loose or unkeyed rocks on the slope face, and any unkeyed rock shall be promptly removed.

- f. Habitat Mix shall be uniformly placed over the riprap armoring layer and over specified areas of existing riprap as shown on the Drawings to fill the interstices of the larger stone.
- g. Voids greater than 18 inches (in average plan dimension) in riprap at elevations between 0 feet MLLW and +13 feet MLLW shall be filled with gravel mix prior to placing habitat mix.

3.2.2 RA2a and RA3 Material Placement

The base layer of sand cap mix may be placed in RA2a and RA3 mechanically or by hydraulic washing from a barge, and the top layers of coarse sand and gravel mix may be placed mechanically. Other method(s) may be proposed by the Contractor and may be approved in advance by the CO. Equipment such as conveyors may be used to place materials under the Crowley Marine Services dolphins. Cap material shall be placed at rates not to exceed those shown on Table 02483-9.

3.2.3 RA2b Material Placement

Cap material may be placed in RA2b mechanically or by hydraulic washing from a barge, or by other method(s) proposed by the Contractor and approved by the CO. Cap material shall be placed at rates not to exceed those shown on Table 02483-9.

3.2.4 RA4 Material Placement

Cap material may be placed in RA4 mechanically or by hydraulic washing from a barge, or by other method(s) proposed by the Contractor and approved by the CO. Cap material shall be placed at rates not to exceed those shown on Table 02483-9.

RA4 has the most restrictive lift thickness requirements (to avoid bearing capacity failures and potential landsliding) and thus the placement will be monitored intensively.

**Table 02483-9
ALLOWABLE LIFT THICKNESSES AND CONSOLIDATION PERIODS
FOR CAP PLACEMENT**

Remediation Area	Lift Number	Maximum Allowable Thickness of Cap Lift (ft) ^a	Maximum Allowable Placement Rate (ton/acre) ^b	Required Consolidation Period
1	1	1	--	Allow 48 hours consolidation between lifts ^c
	2	2	--	
	3, 4, 5	5	--	
2a, 2b, 3	1	1	2100	Allow 48 hours consolidation between lifts
	2	2	4200	
	3, 4	2	4200	
4	1	0.5	1200	Allow 48 hours consolidation between lifts
	2	0.75	1800	
	3, 4	1.75	4000	

Notes:

^a Maximum allowable thicknesses are based on bearing capacity analyses. In RA1, Contractor shall not place individual lifts in greater thicknesses than those shown in this column.

^b In RA2a, RA2b, RA3, and RA4, Contractor shall place cap material at rates not to exceed those shown in this column.

^c Consolidation period does not apply to placement of riprap and filter material on armored slopes.

-- - Not applicable

Table 02483-10
CAP THICKNESS REQUIREMENTS

Remediation Area	Minimum Cap Thickness (inches)	Overplacement Allowance (inches)	Underplacement Tolerance (inches)
RA1	^a	12	12 ^b
RA2a	42	12	0
RA2b	30	12	0
RA3	42	12	0
RA4	30	12	0

Notes:

^a Grade final surface of RA1 to lines and grades shown on Drawings. Outer flank of toe berm may deviate from the lines and grades shown on the Drawings.

^b Underplacement tolerance in RA1 is 12 inches at elevations below 0 ft MLLW. There is no underplacement tolerance above 0 ft MLLW.

3.3 WATER QUALITY MONITORING

The Contractor shall perform water quality monitoring during capping activities in accordance with Section 01355 ENVIRONMENTAL PROTECTION.

3.4 CAP VERIFICATION

Sediment cap verification sampling, including field and laboratory procedures, shall be described in detail in the approved Contractor's Sampling and Analysis Plan (SAP), including Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP), submitted in accordance with Section 01450 CHEMICAL DATA QUALITY CONTROL.

The CO shall be notified at least 48 hours in advance of any cap verification sampling activities. The Contractor shall provide space on board the sampling vessel for up to 3 personnel designated by CO to observe verification sampling activities, if so requested by the CO.

3.4.1 Chemical Testing Parameters

Where chemical testing is designated, the Contractor shall analyze cap verification samples for the chemicals of concern (COCs), using the analytical methods, and quantification limits listed in Section 01450 CHEMICAL DATA QUALITY CONTROL, Table 01450-2.

3.4.2 Cap Verification Sampling Reports

Chemical analytical work for cap verification sampling will be conducted on an accelerated 14 calendar-day turnaround time, unless otherwise specified by the CO. Cap Verification Sampling Reports shall be submitted to the Government no later than 21 calendar days after completion of the field sampling activities for each sampling event. The reports shall include the following:

- a. Sample Location Map, with remediation boundaries and sample locations posted based on actual field coordinates.
- b. Field geologic descriptions of surface sediment samples.
- c. Core logs, where required (e.g., cap thickness verification).
- d. Analytical Laboratory Report, including project narrative, chain-of-custody records, and QA/QC information in accordance with Section 01450 CHEMICAL DATA QUALITY CONTROL.
- e. Independent Data Quality Review by a qualified chemist not employed by the Contract analytical laboratory, to assess data precision, accuracy, and completeness, as specified in Section 01450 CHEMICAL DATA QUALITY CONTROL.

3.4.3 Cap Verification Sampling

Where cap verification sampling is specified in a given area, the Contractor shall not place additional material in that area until the CO approves the cap verification sampling results and identifies the need for response actions.

3.4.3.1 Cap Verification Sampling Events and Locations

The Contractor shall perform cap verification sampling as specified at the below listed times and locations during this Contract. The sampling requirements are summarized in Table 02483-11. All sediment core samples shall be collected at the locations shown on the Drawings, unless otherwise indicated by the CO. Cores shall be driven a minimum of 12 inches into native material. The cap thickness, the depth to the basal contact, and the nature of the basal contact (e.g., sharp, gradational, intermixed, etc.) shall be logged by a qualified geologist. All coring and sample collection shall be conducted in accordance with PSEP guidelines (PSEP 1997). Hydrographic survey data shall be used in conjunction with cap verification sampling to assess the thickness of the cap. Hydrographic surveys shall be in accordance with Section 01720 SURVEYING.

- a. Cap Thickness Verification. All sediment cores and Sediment Profile Imaging (SPI) images described below shall be evaluated to assess the physical thickness of the cap and individual layers of the cap. Core samples shall be collected:
 - i. After placement of first lift of sand cap mix in RA1, RA2a, RA2b, and RA3.
 - ii. After placement of the final lift of sand cap mix in RA1, RA2a, RA2b, RA3, and RA4.
 - iii. After placement of coarse sand in RA2a.

- b. First Lift of Sand Cap Mix. In RA1, RA2a, RA2b, and RA3, the Contractor shall collect cores following placement of the first lift of sand cap mix. The Contractor shall perform visual inspection of the cores for evaluation of intermixing with native sediments and determination of lift thickness.
- c. First Lift in RA4 SPI. In RA4, the Contractor shall conduct SPI surveys following placement of the first lift of sand cap mix. The Contractor shall assess the images for evaluation of intermixing with native sediments and determination of lift thickness. The frequencies for image surveys are summarized in Table 02483-12.
- d. Final Sand Cap Mix Lift. In RA1, RA2a, and RA3, the Contractor shall collect cores following placement of the final lift of sand cap mix. The Contractor shall perform visual inspection of the cores for determination of sand cap mix layer thickness. The Contractor shall analyze surface sediment samples (top 4 inches) from the cores, to represent the sand cap mix surface. These samples shall be collected as baseline data for long-term monitoring, therefore, no compliance evaluation requirements for chemistry are described in this Section. However, the CO may require response actions if visual evidence of contamination exists at the sand cap mix layer surface. Chemical testing of the samples shall be conducted as specified in paragraph 3.4.1 Chemical Testing Parameters.
- e. Mid-Point of Cap. In RA2b and RA4, the Contractor shall collect cores following completion of the cap and analyze samples from a 4-inch interval at the mid-point of the cap profile. These samples shall be collected as baseline data for long-term monitoring, therefore, no compliance evaluation requirements are described in this Section. Chemical testing of the samples shall be conducted as specified in paragraph 3.4.1 Chemical Testing Parameters.
- f. Cap Surface Verification. In RA2a, RA2b, and RA4, the Contractor shall collect cores following completion of the cap and analyze samples from the top 4 inches of the cap surface. For RA2b and RA4, these samples shall be from the same cores used for the mid-point of cap samples. Chemical testing of the samples shall be conducted as specified in paragraph 3.4.1 Chemical Testing Parameters.

3.4.3.2 Compliance Evaluation

In general, chemical concentrations in surface sediments (top 4 inches) on the final grade of the cap must be below the Sediment Quality Standards (SQS). The SQS are listed in Section 01450 CHEMICAL DATA QUALITY CONTROL, Table 01450-2.

- a. First Lift of Sand Cap Mix. Excessive intermixing is defined as the visible presence of native sediments intruding more than 6 inches (RA1, RA2a, RA2b, and RA3) or 4 inches (RA4) into the cap material. In response to observed excessive intermixing of sand cap mix material with native sediments, based on visual inspection, the Contractor shall modify operations to minimize cross-contamination, disturbance and resuspension of the underlying sediments. The Contractor shall modify operations if measured lift thicknesses exceed the prescribed limits in Table 02483-10.

- b. First Lift in RA4 (SPI). The following criteria shall be used to evaluate SPI results for the first lift in RA4:
 - i. At least 90 percent of samples shall show a minimum thickness of 1 inch.
 - ii. At least 50 percent of samples shall show a minimum thickness of 4 inches.

Response actions will be required if these criteria are not met.

- c. Sand Cap Mix Layer in RA1, RA2a, and RA3. Where thickness of the sand cap mix is less than the minimum thickness shown on the Drawings, the Contractor shall place additional sand cap mix to achieve the required thickness prior to placing subsequent lifts of coarser material.
- d. Cap Surface Verification – Final Lift. All surface sediment samples on the final cap surface must be below the SQS. Response action(s) will be required for any SQS exceedances on the final cap surface.
- e. Final Cap Thickness Verification. The cap thickness in RA1 shall be determined by hydrographic and topographic surveys. The cap thickness in RA2a, RA2b, RA3, and RA4 shall be determined by sediment core logs and verified by hydrographic surveys. Cap thickness shall be determined after correcting the core depths for coring induced compaction. Tolerances (overplacement, underplacement, and maximum grades) are shown on the Drawings. Response actions will be required for all areas with a lesser thickness of capping material than specified. Response actions will be required for any area greater than 2,500 square feet that exhibits a cap thickness greater than the design thickness plus the over placement allowance. Response actions will be required for any location that exhibits a cap thickness greater than the design thickness plus twice the overplacement allowance. Response actions will be required for oversteepend areas in RA1.

3.4.3.3 Response Actions

Response actions will be determined on a case-by-case basis by the CO. Response actions may include any of the following, alone or in combination:

- a. Additional Capping. Additional capping material shall be added, as necessary, to ensure that all portions of the cap meet the cap thickness requirements of Table 02483-11.
- b. Offset Sampling. If a verification sample indicates that the final cap surface exceeds the SQSs, conduct offset sampling as shown on the Drawings. Core samples shall be collected at each of the four offset sampling locations. A sample of the 0 to 4 inch depth interval from each of the cores shall be analyzed for any constituents that exceeded the SQS concentrations, shown in Table 01450-2, in the original sample analysis. Where offset sampling is required, a core shall also be collected from the

- initial sampling location that exceeded the SQS, and samples from the following depth intervals shall be analyzed: 0 to 4, 4 to 12, 12 to 24, and 24 to 36 inches.
- c. Overcapping. If the offset sampling confirms that final cap surface exceeds the SQSs, additional thin lifts (e.g., 6 to 12-inch lifts) of capping material may be added to the surface as directed by the CO. However, placement of additional capping material shall not compromise the navigational requirements of the waterway.
 - d. Modification of Operations. If monitoring detects non-uniform placement, excessive lift heights, or excessive intermixing of native sediments and cap materials, the Contractor shall implement operational modifications at no expense to the Government, that may include:
 - i. Limiting the fall distance of the cap material through the water column,
 - ii. Slowing the placement rate (tons per acre or tons per day),
 - iii. Modify placement methods or equipment, and/or
 - iv. Other modifications, as directed by the CO.
 - e. Re-grading. In RA1, if the final cap surface exceeds the design lines and grades plus the overplacement allowance above 0 feet MLLW, the Contractor shall re-grade to the proper lines and grades at no expense to the Government.

Table 02483-11
CAP VERIFICATION SAMPLING REQUIREMENTS

RA	Event	Sample Type ^a	Analysis ^b	No. of Cores ^c	No. of Samples Analyzed
1 (gravel cap areas only)	First sand cap mix lift	Core	Visual inspection for intermixing with native sediments	10	0
	Final sand cap mix lift	Core	Chemical analysis (0-4 inches)	10	10
2a	First lift	Core	Visual inspection for intermixing with native sediments	5	0
	Final sand cap mix lift	Core	Chemical analysis (0-4 inches)	5	5
	Final cap surface and profile	Core	Chemical analysis at surface (0-4 inches)	5	5
2b	First lift	Core	Visual inspection for intermixing with native sediments	4	0
	Final cap surface and profile	Segmented core	Chemical analysis at surface (0-4 inches) and a 4-inch interval at the mid-point of the cap	4	8
3	First lift	Core	Visual inspection for intermixing with native sediments	2	0
	Final sand cap mix lift	Core	Chemical analysis (0-4 inches)	2	2
4	Final cap surface and profile	Segmented core	Chemical analysis at surface (0-4 inches) and a 4-inch interval at the mid-point of the cap	15	30

Notes:

^a All cores shall penetrate a minimum of 12 inches into native material. All cores shall be relatively undisturbed samples. All cores shall be logged and evaluated for thickness of cap and individual layers.

^b Chemical analysis includes COCs and TOC, reported in mg/kg dry weight. Reporting limit for TOC = 0.1%.

^c See Drawings for sampling locations. Re-occupy first lift stations for collection of final cap samples.

TOC - total organic carbon

COC - chemical of concern

Table 02483-12
SUMMARY OF SEDIMENT PROFILE IMAGING SURVEYS IN RA4

Survey Area ^a	Approximate Survey Density	No. of Images
Segment 1- Below -90 ft MLLW	60 ft on center	40
Segment 1- Above -90 ft MLLW	60 ft on center	40
Segment 2	90 ft on center	40
Segment 3	90 ft on center	40

Notes:

^a Survey areas are shown on the Drawings. All surveys to follow placement of first lift of material.

ft - feet or foot

MLLW - mean lower low water

3.5 FINAL EXAMINATION AND ACCEPTANCE

As soon as practicable after the completion of capping, (and prior to close of a given construction season) individual areas will be examined by the Government. The Contractor will be permitted to inspect the data and methods used in preparing the final estimate. When individual areas are found to be in a satisfactory condition, the Work therein will be accepted as complete. Final estimates will be subject to deductions or correction of deductions previously made because of capping outside of authorized areas or placement of material in an unauthorized manner.

END OF SECTION

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